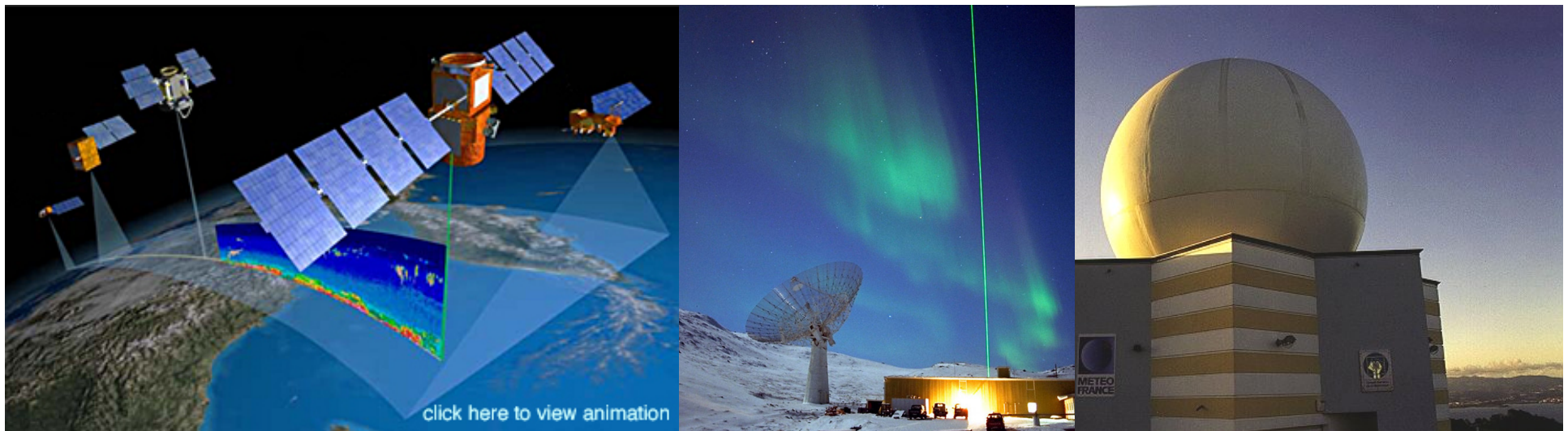
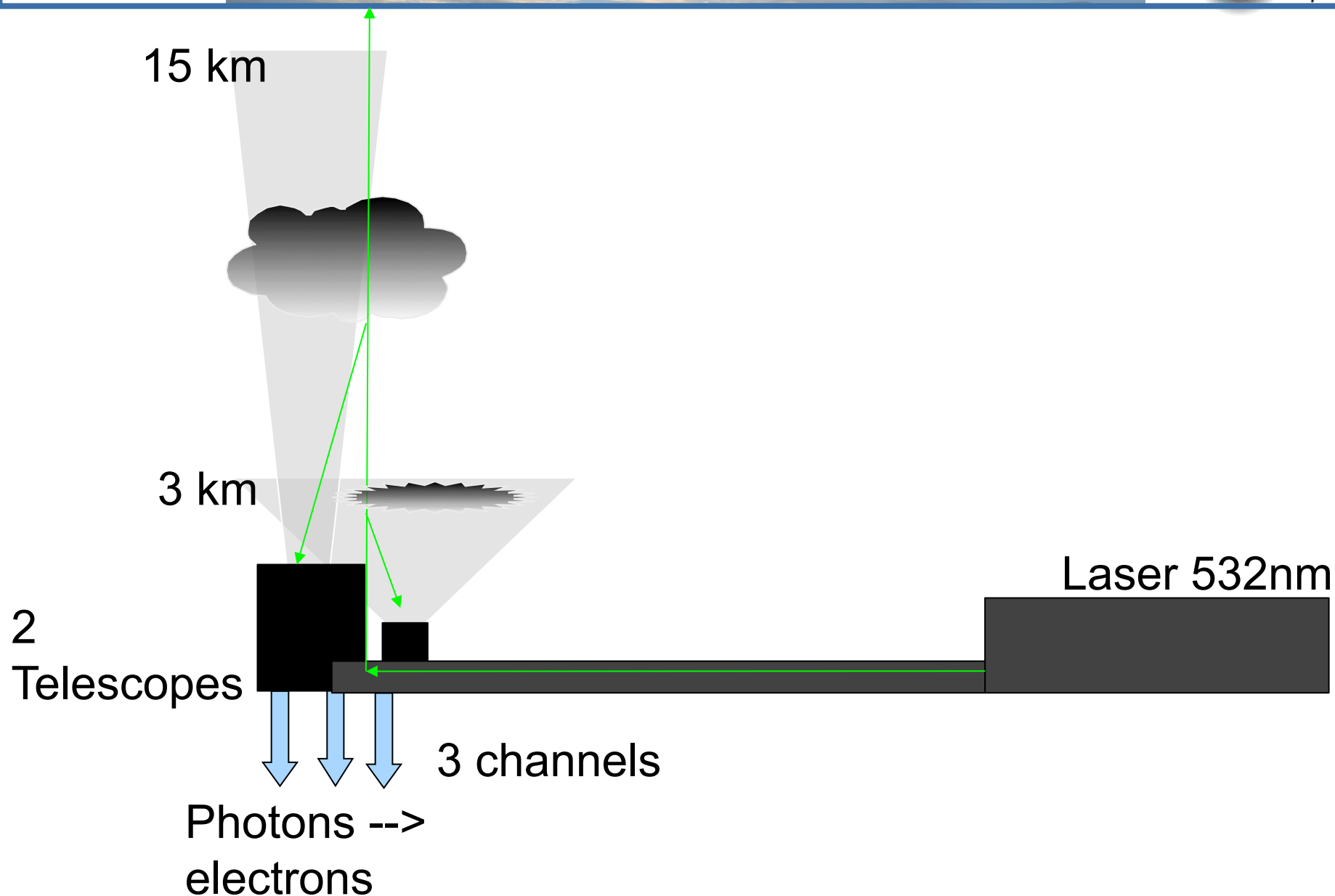


Active Remote Sensing of the atmosphere


— Student restitution —

08 July 2010





Measurement principle – lidar system

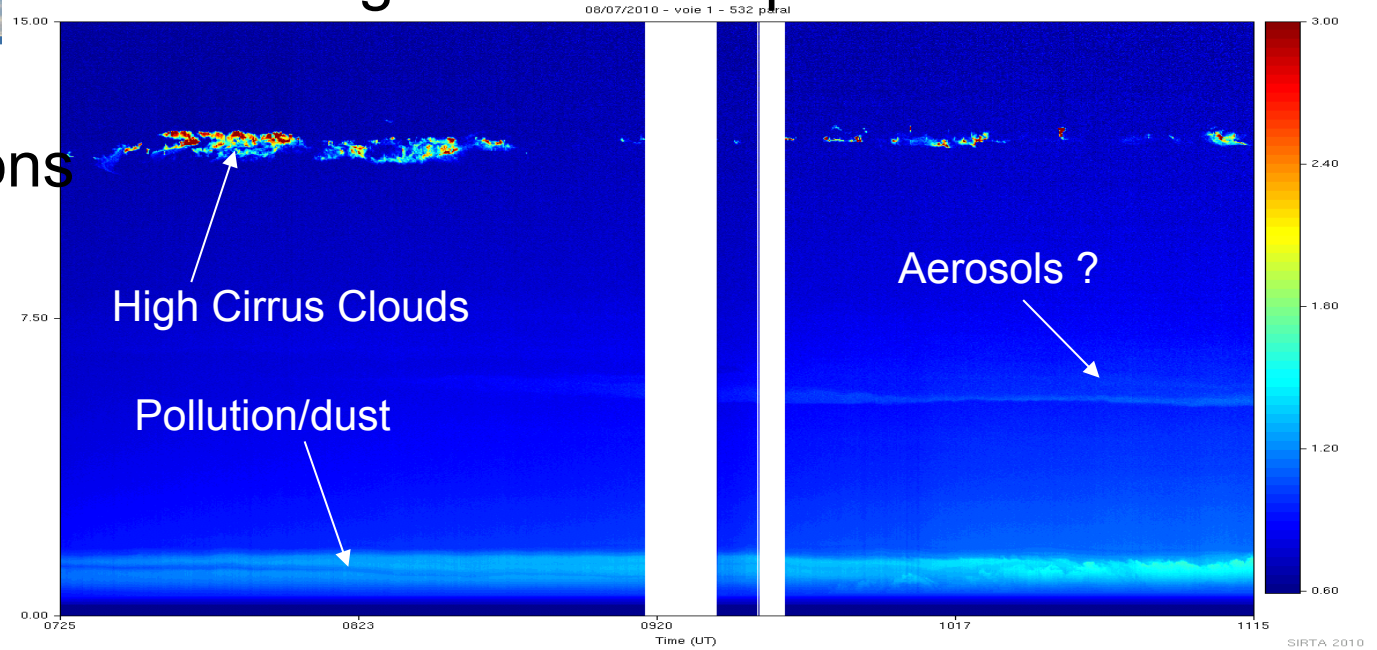
 Impossible d'afficher l'image. Votre ordinateur manque peut-être de mémoire pour ouvrir l'image ou l'image est endommagée. Redémarrez l'ordinateur, puis ouvrez à nouveau le fichier. Si le x rouge est toujours affiché, vous devrez peut-être supprimer l'image avant de la réinsérer.

Normal Day Conditions

08 July 2010

Scale: 0 – 15 km

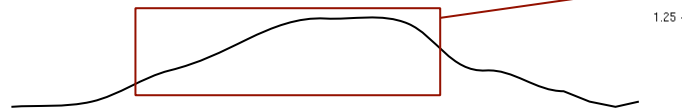
Boundary Layer
~ 2 km



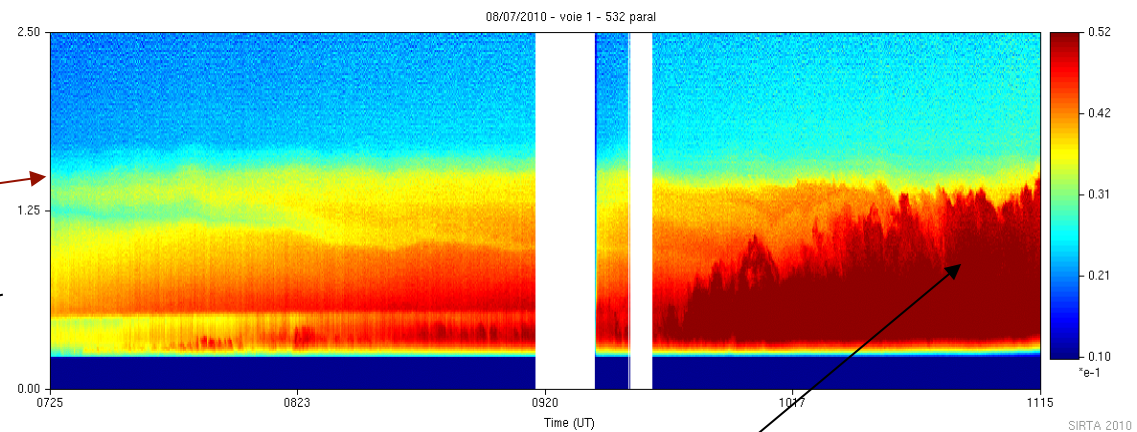
Atmospheric Boundary Layer

0h

12h

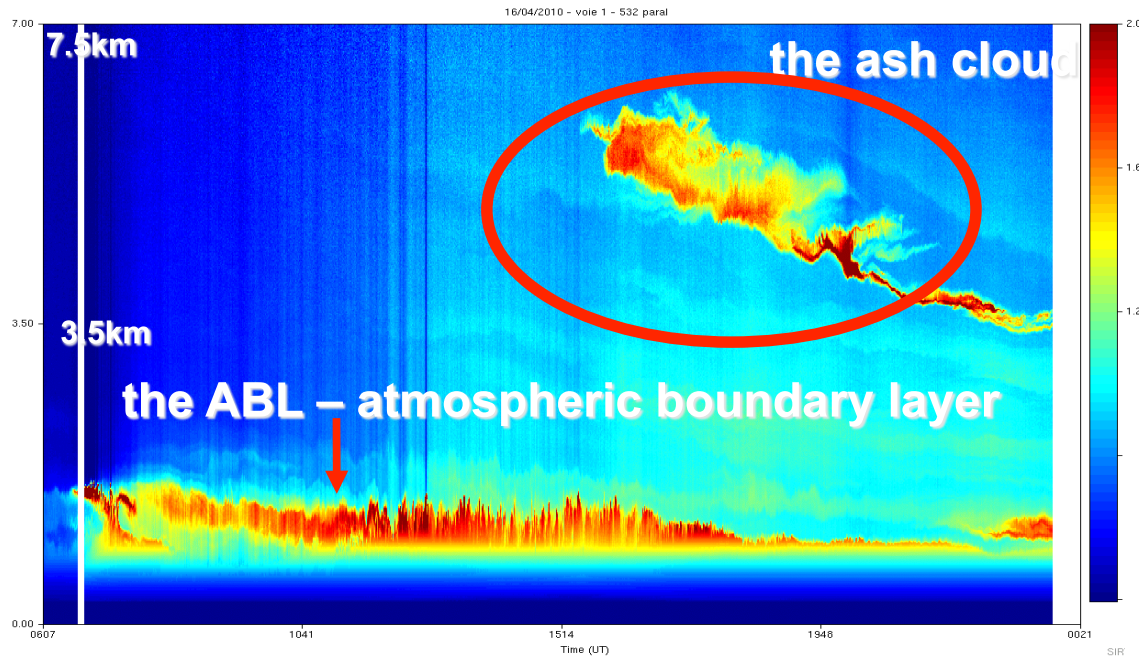


Diurnal Cycle

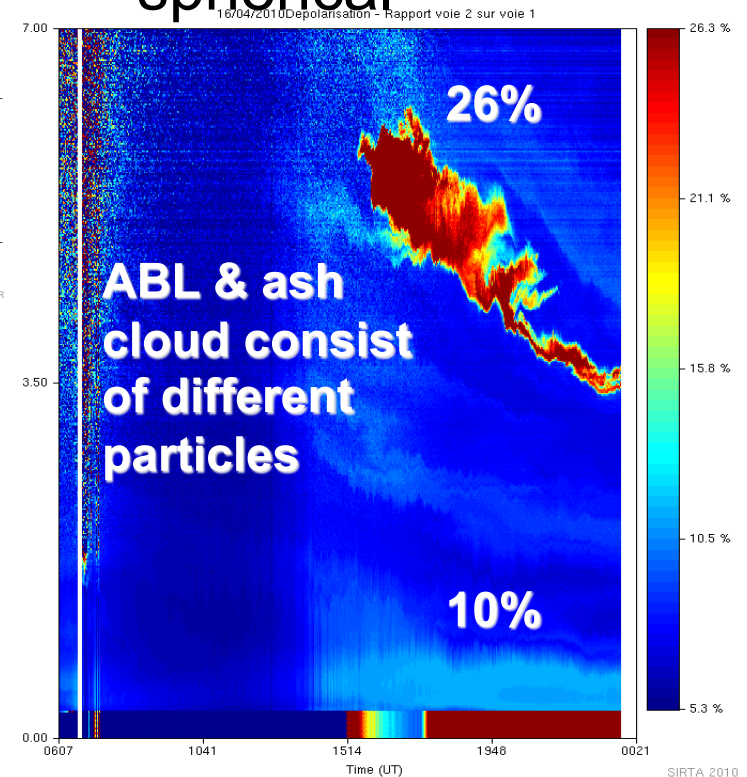


Rising Boundary Layer

Observing the ash cloud on 16-April-2010 over Paris



... depolarising
the image:
ABL is more
spherical



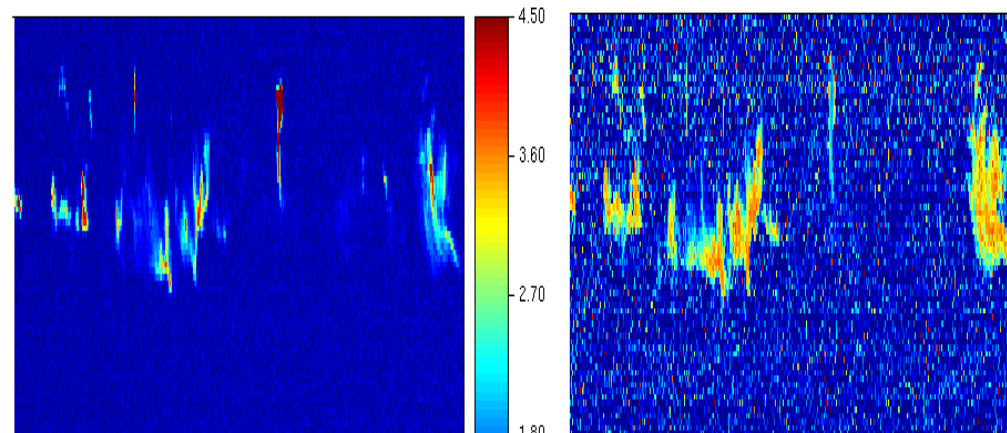
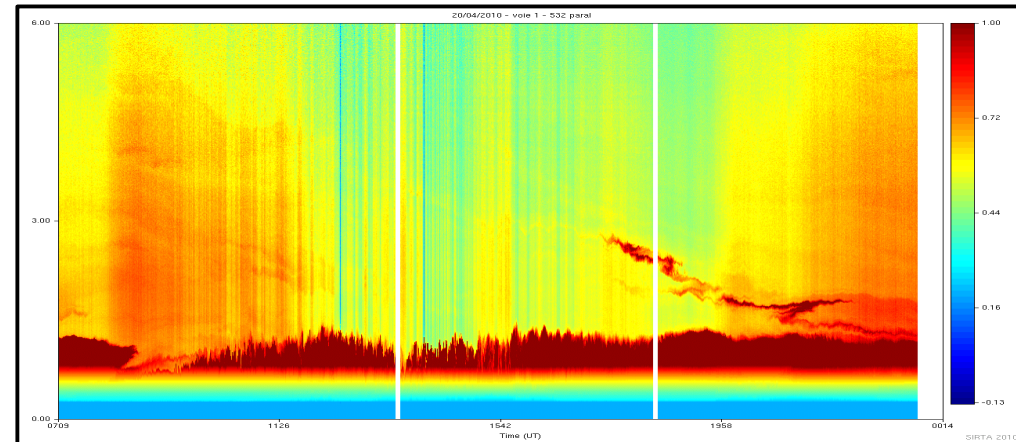
The ash cloud seems to be falling over time ...

unlikely – maybe different wind speeds at different altitudes?

LIDAR features

Retrieve the presence
of **optical thick clouds**

Retrieve the **shape** of
atmospheric particles
with depolarization,
for example contrails



Number of photons

Depolarization

Red = more scattering

Cyan = spherical

Yellow = not spherical

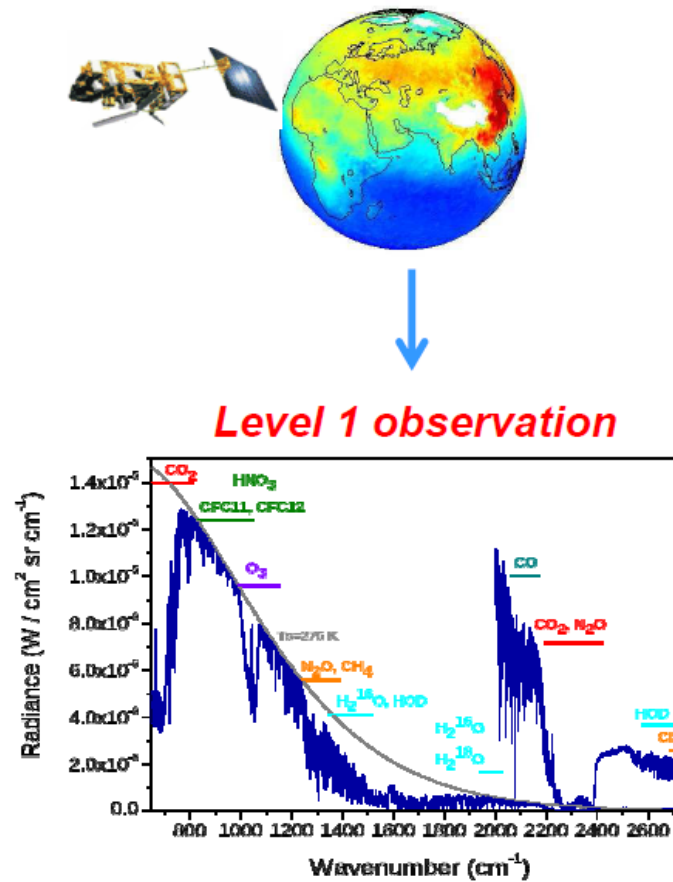
Applications and improvements

Lidar simulator in models to enhance the results

Measuring wind behavior to enhance **skyscrapers'**
exposed architecture

Enhancing our **equipment sizes** to be able to put the
detector and the telescopes in satellite

Satellite observation for atmospheric pollution monitoring

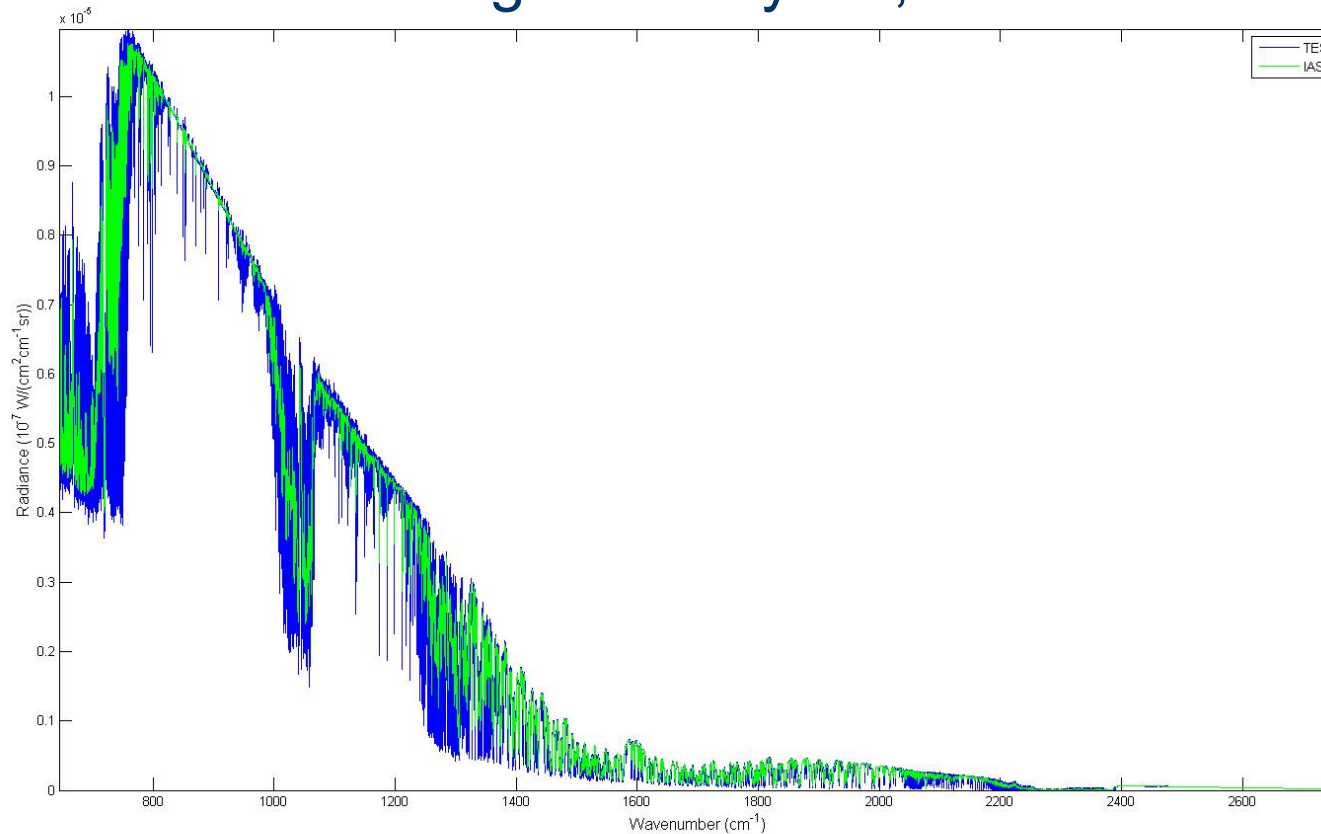


IASI vs. TES

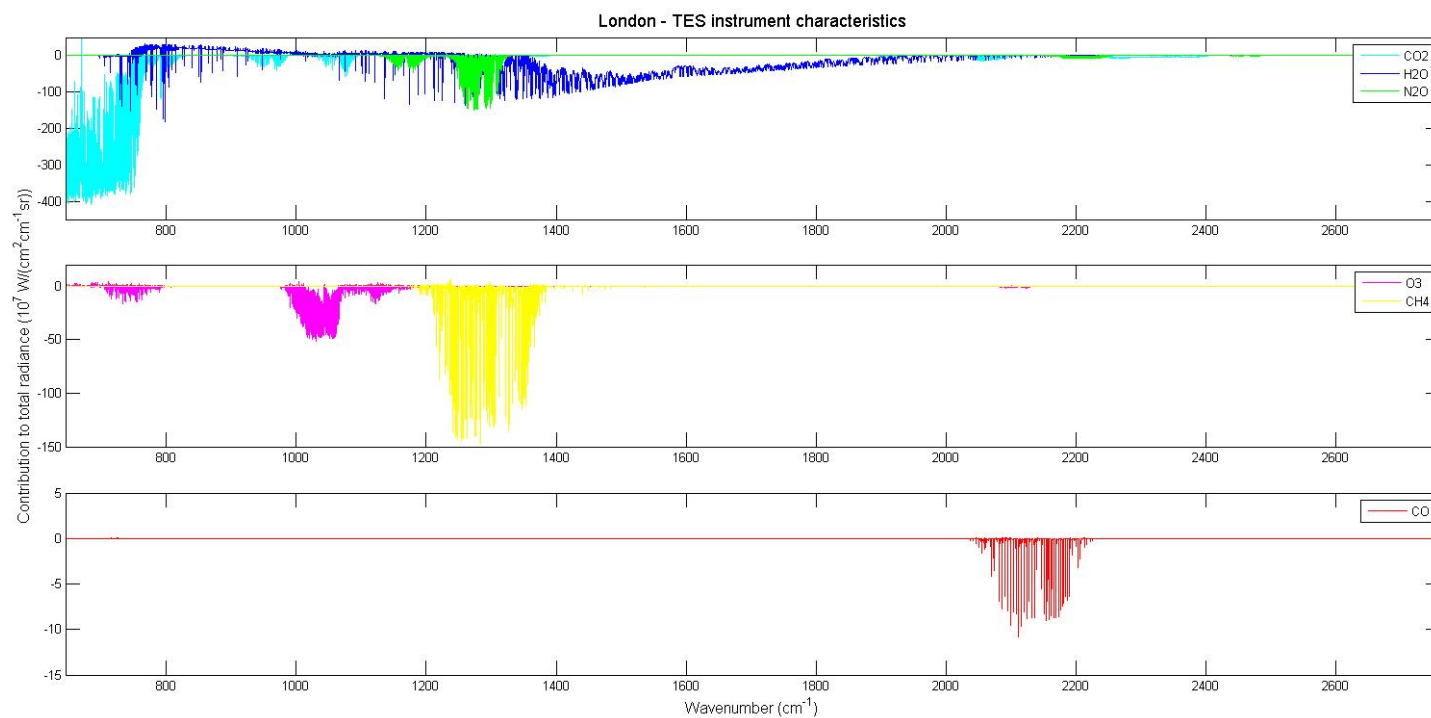
Same measurement technology

TES – measuring atmospheric chemistry, high resolution

IASI- meteorological analyses, lower resolution

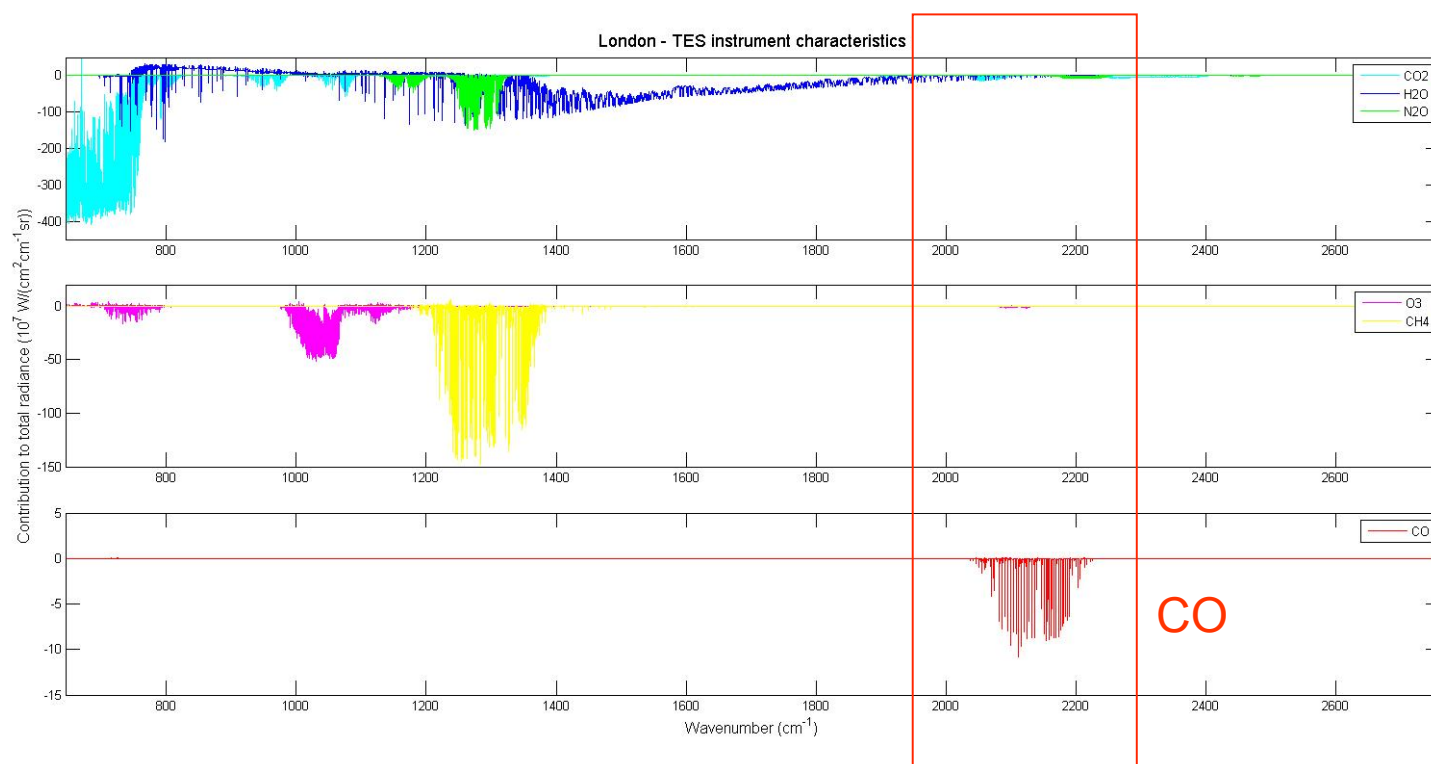


Location: London



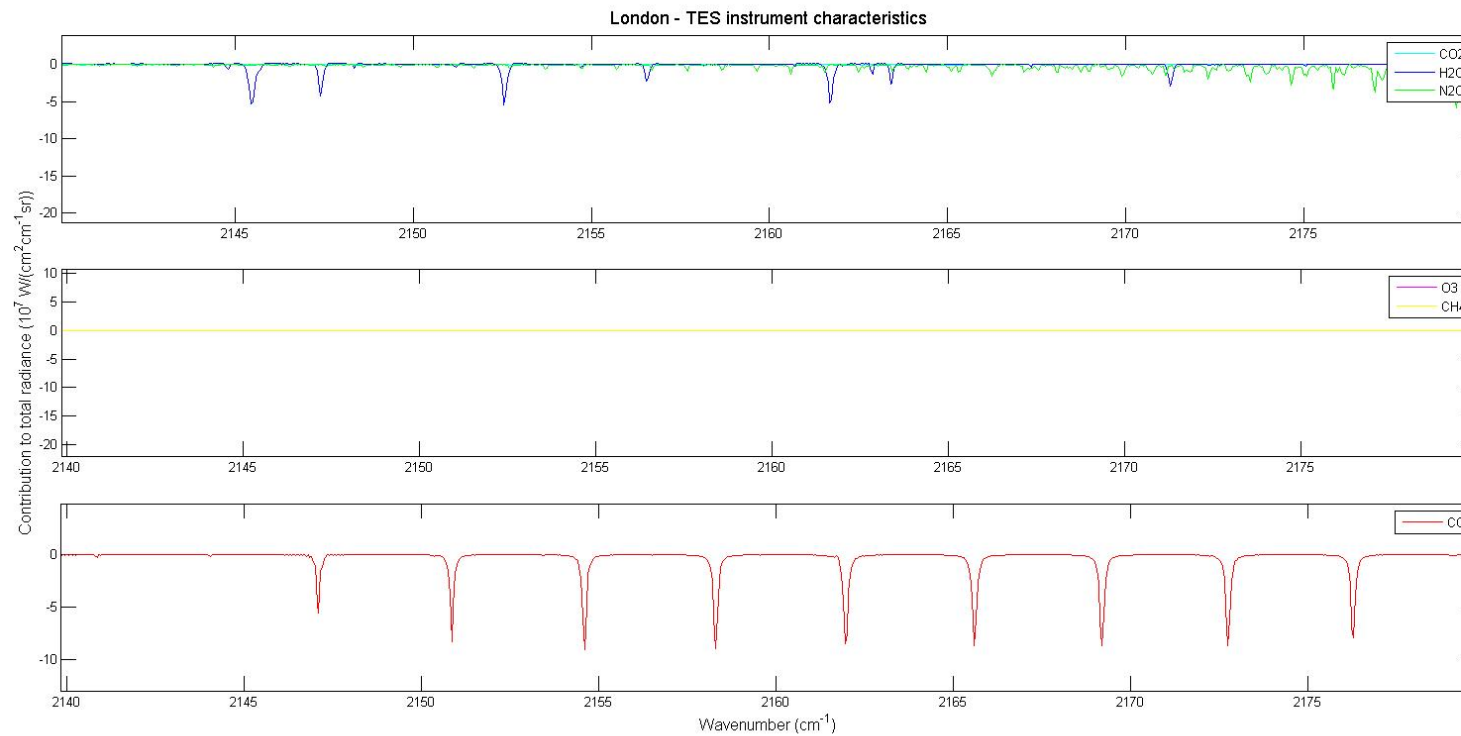
Location: London

Carbon monoxide

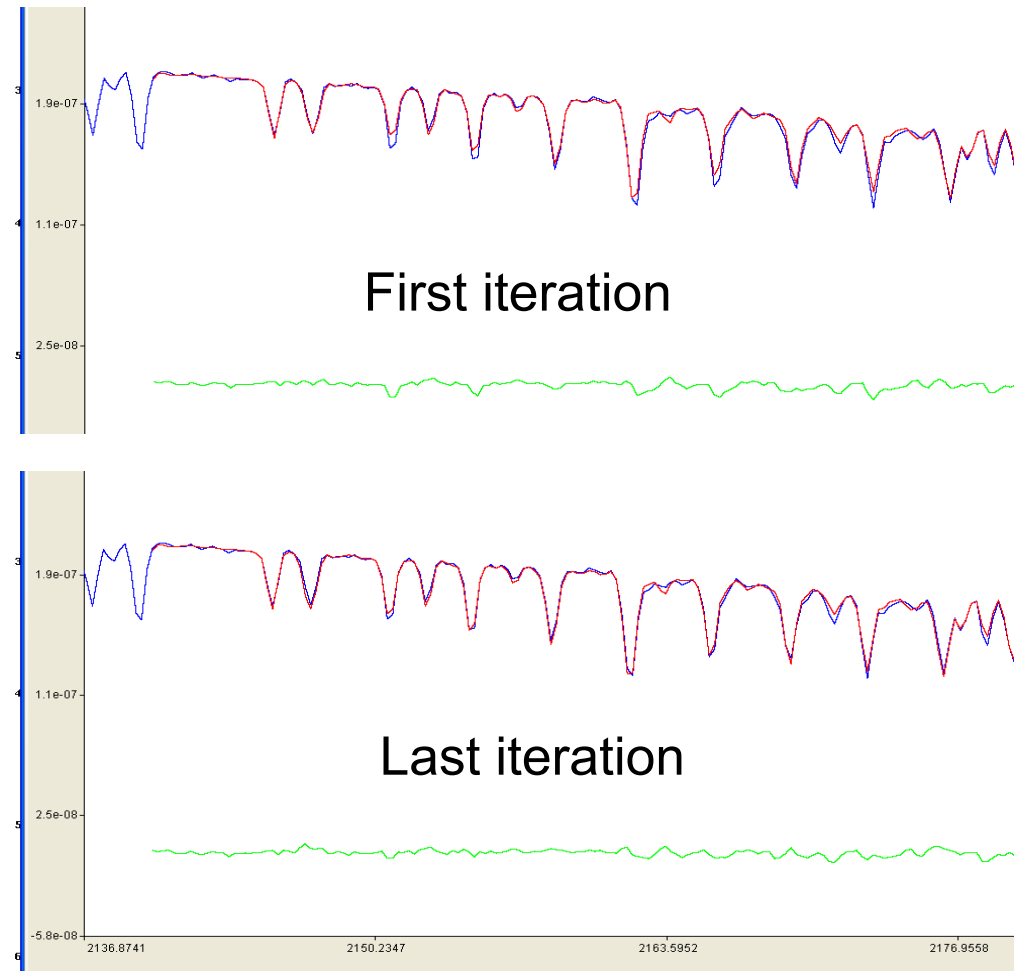
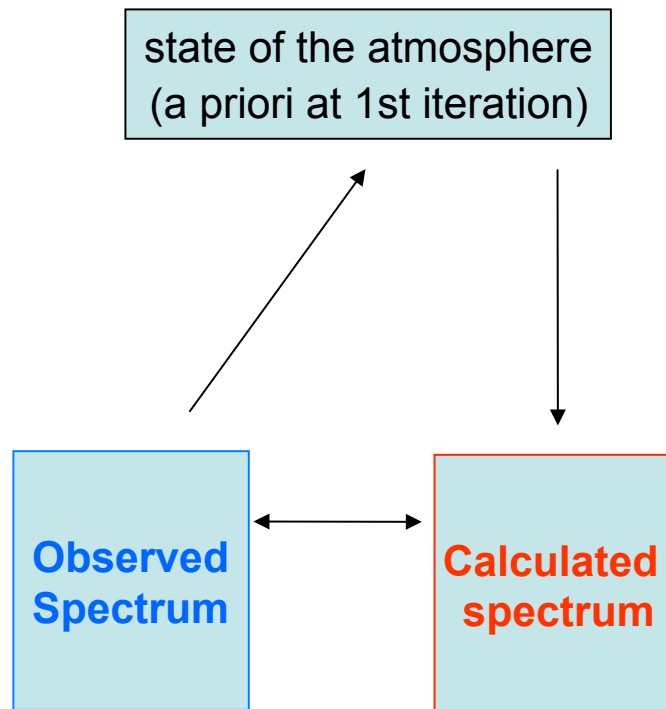


Location: London Carbon monoxide

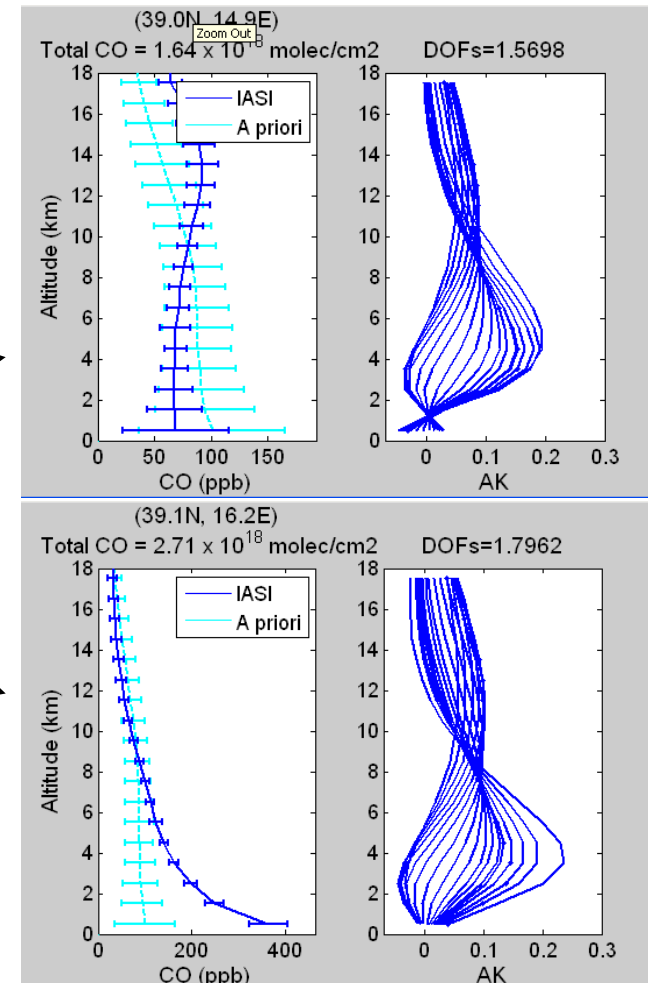
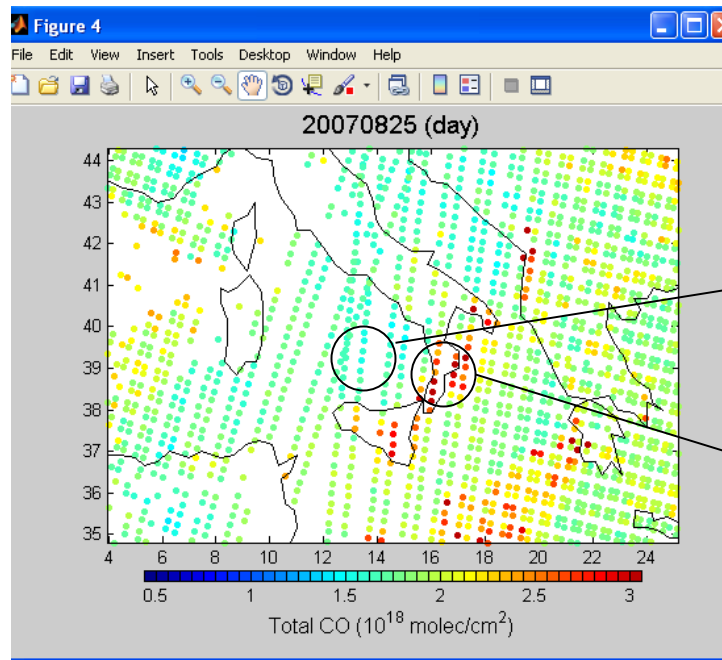
- Analyzed spectrum range of CO -



- Modeling based on a priori data and satellite measurements -



- Observed CO concentrations on August 25th, 2007 -



- A priori data based on airplane measurements-

Ideal satellite mission for the monitoring of trace gases? For climate? For air quality?

Climate:

- Long-term measurement periods → extend lifetime of missions
- Ensure continuous missions of same instruments

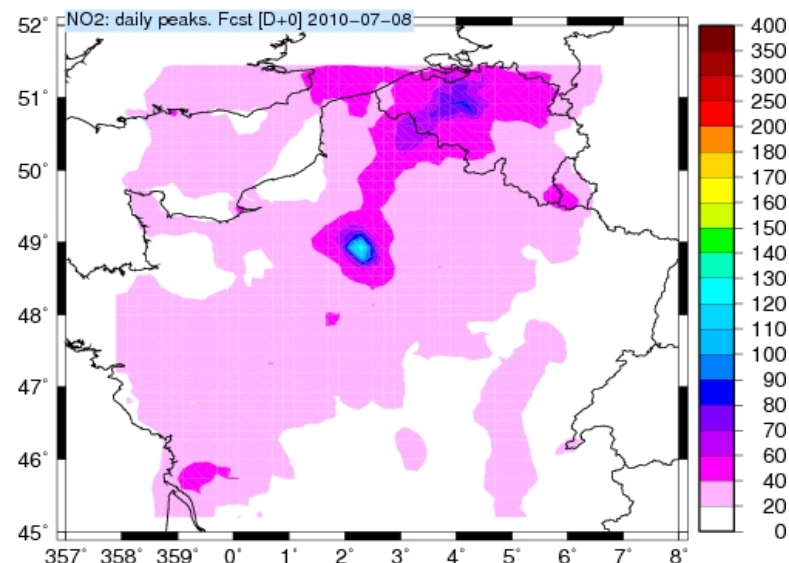
Atmospheric chemistry:

- combine multiple measurement methods for
 - better understanding of
 - feedback effects and
 - interrelations
 - minimization of uncertainties

Air quality:

- Improve sensitivity for surface and transport measurements

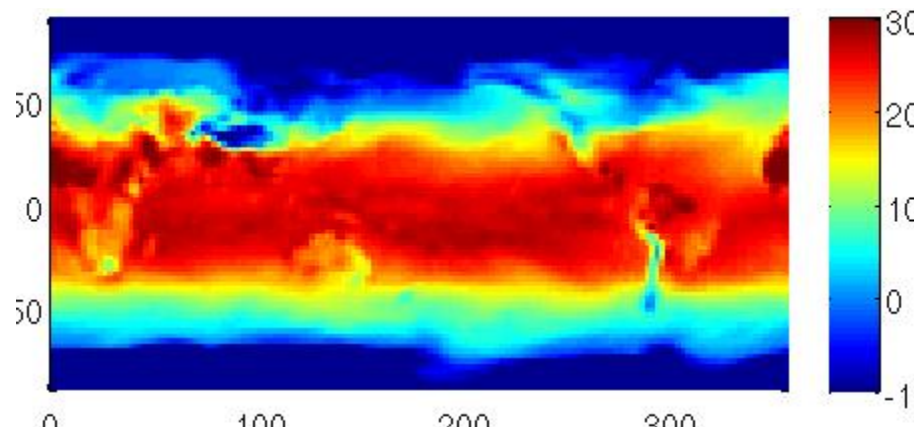
Chemistry-transport model CHIMERE



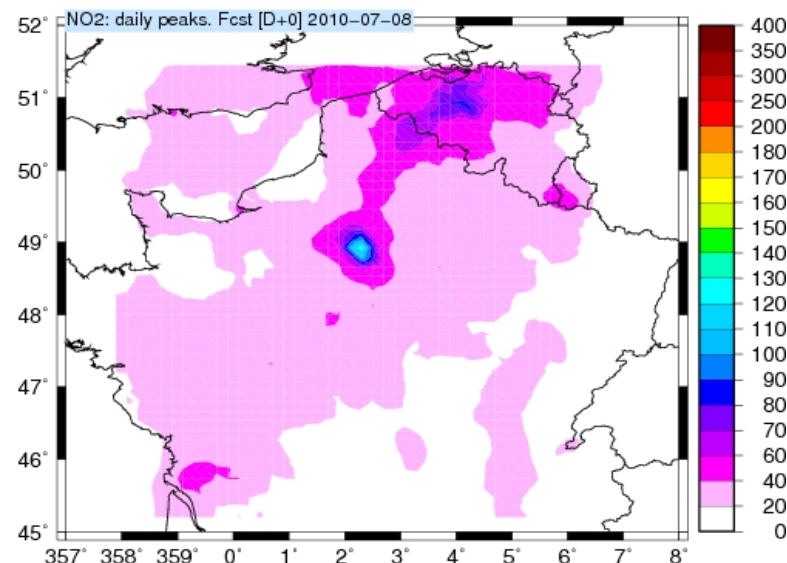
Two analysis as a surrogate for observation:

- ERA40
- NCEP

Climate model: CNRMCM3



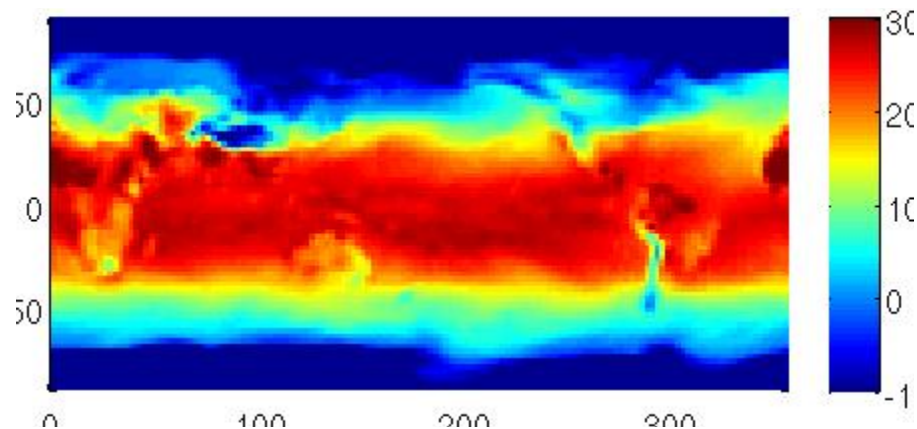
Chemistry-transport model CHIMERE



Two analysis as a surrogate for observation:

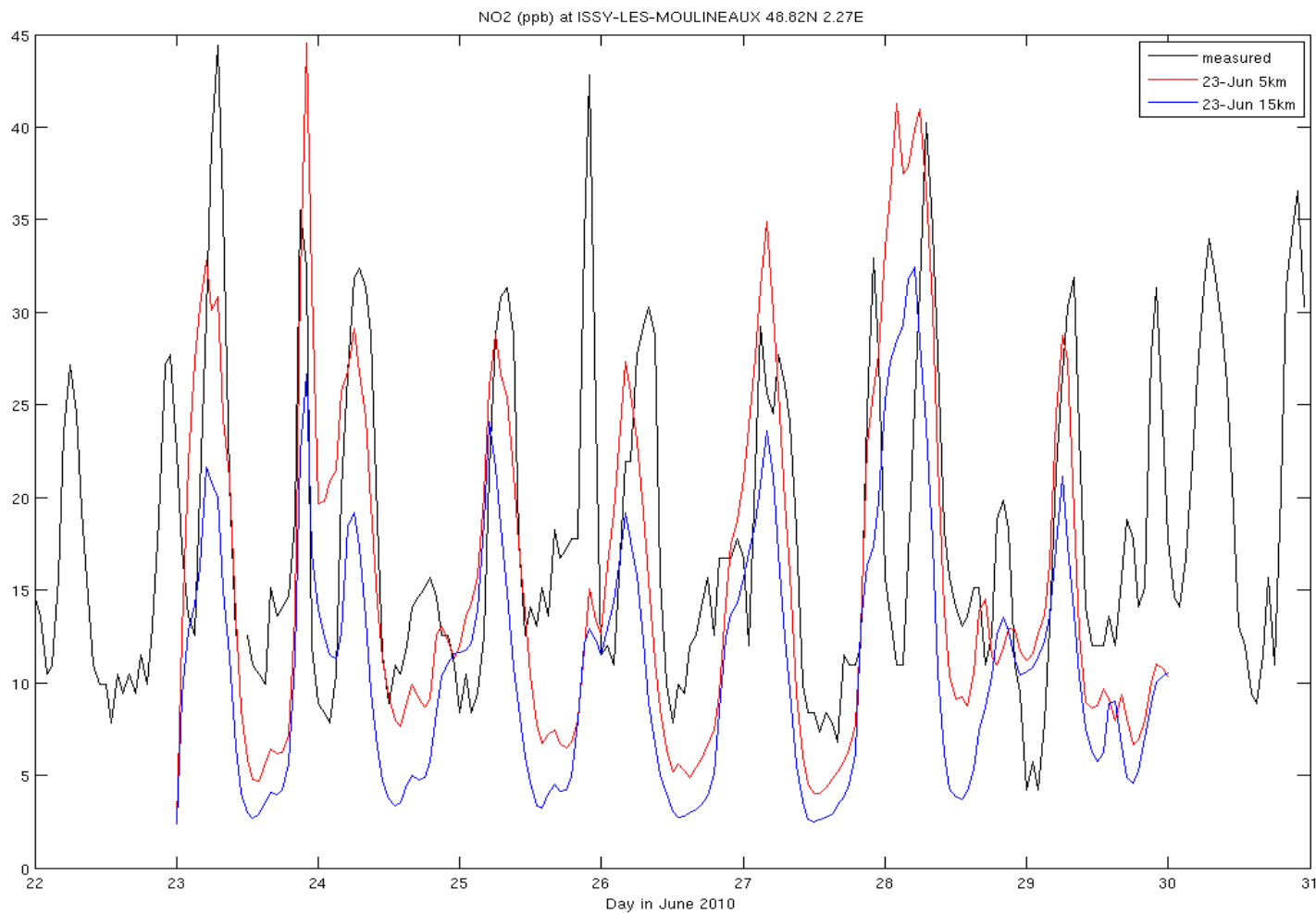
- ERA40
- NCEP

Climate model: CNRMCM3

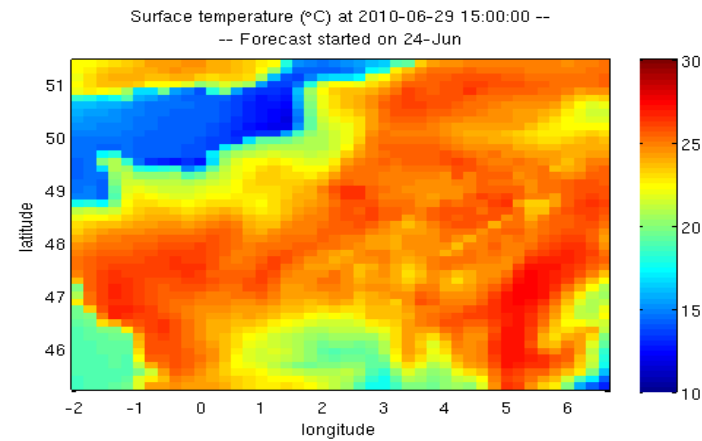
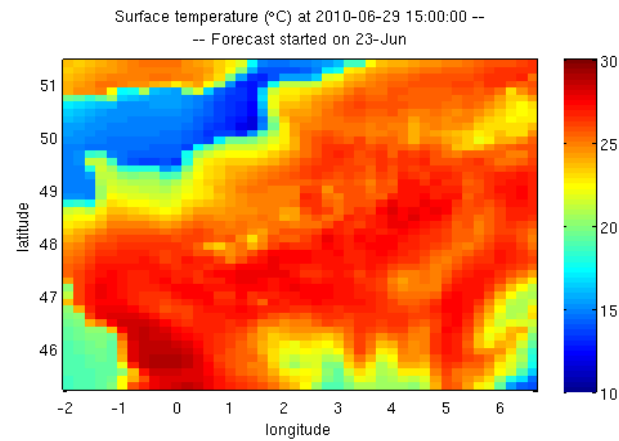
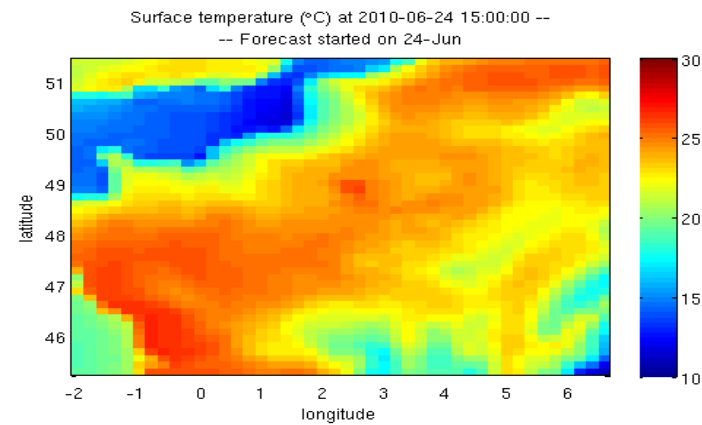
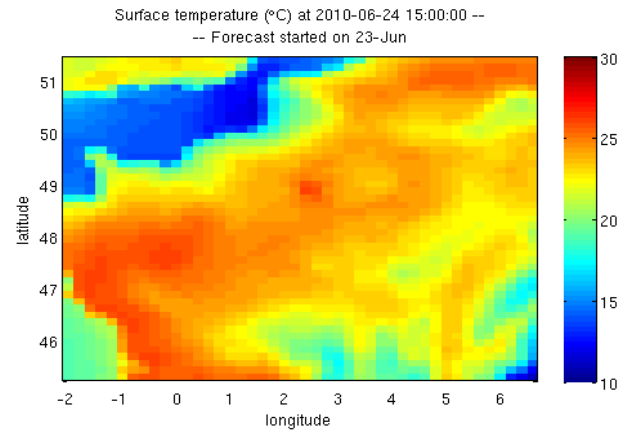


Sensitivity to resolution

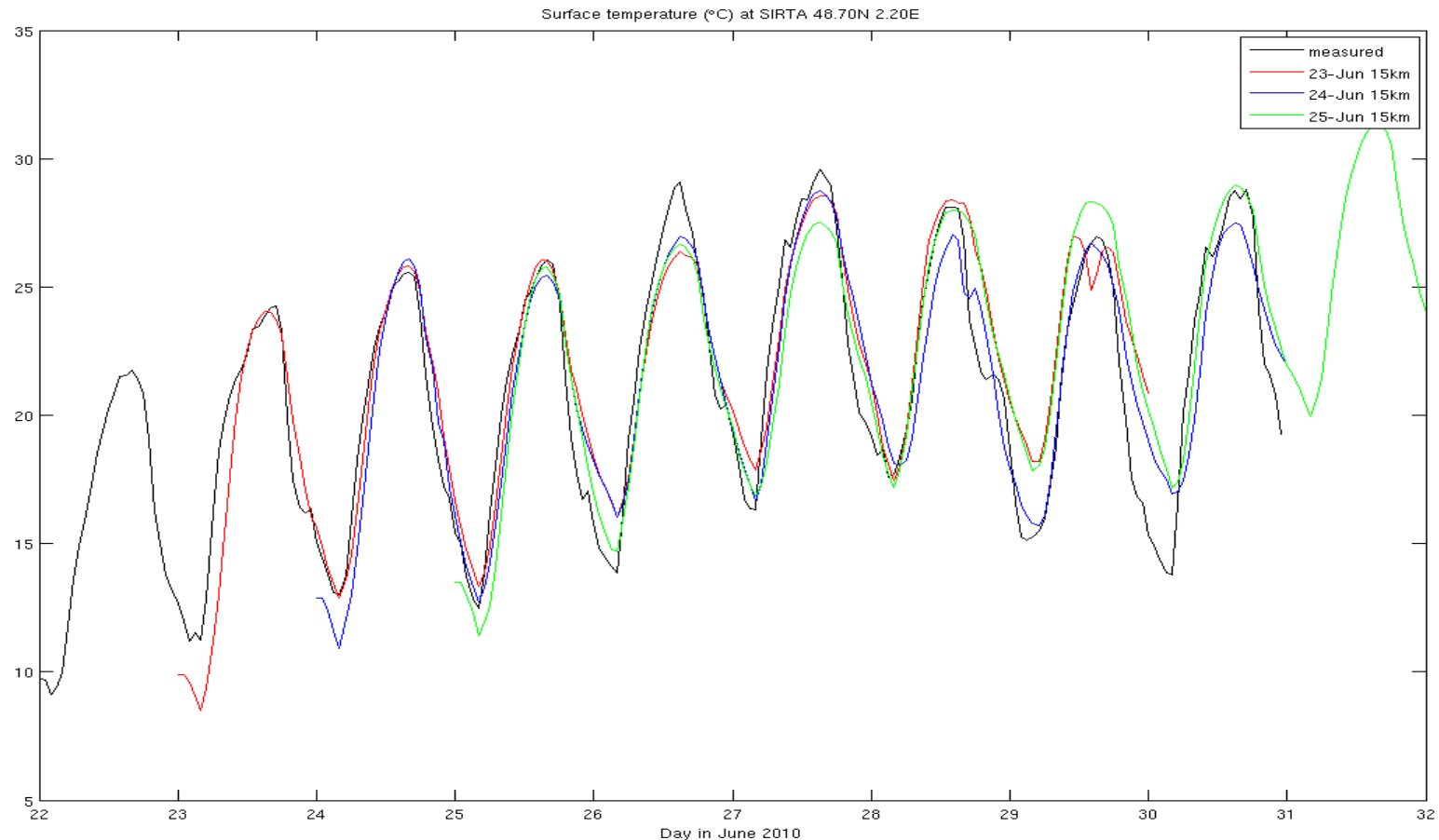
The higher the resolution, the better the model fit is (at a certain point)



Sensitivity to initial conditions



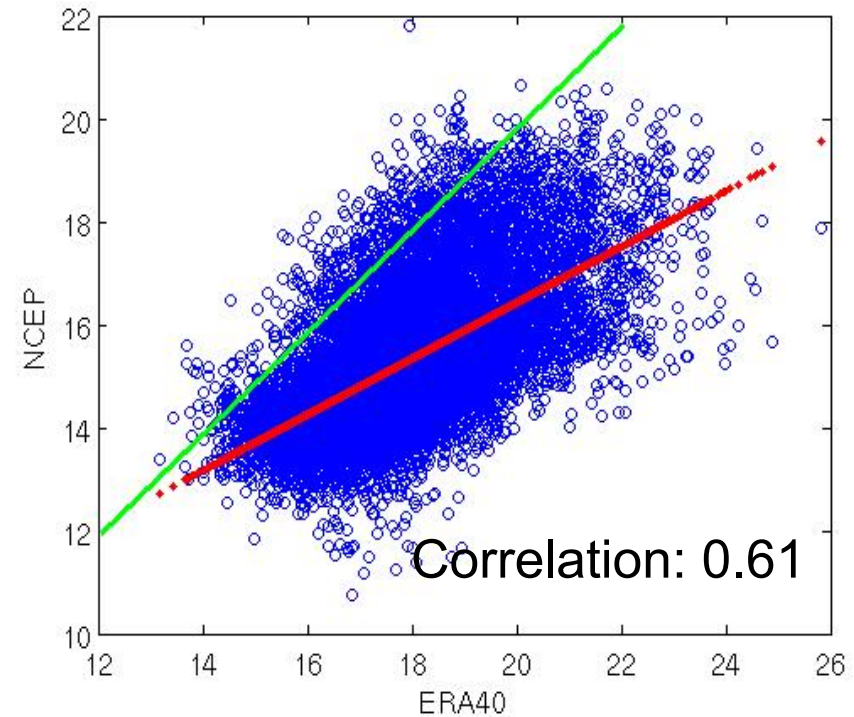
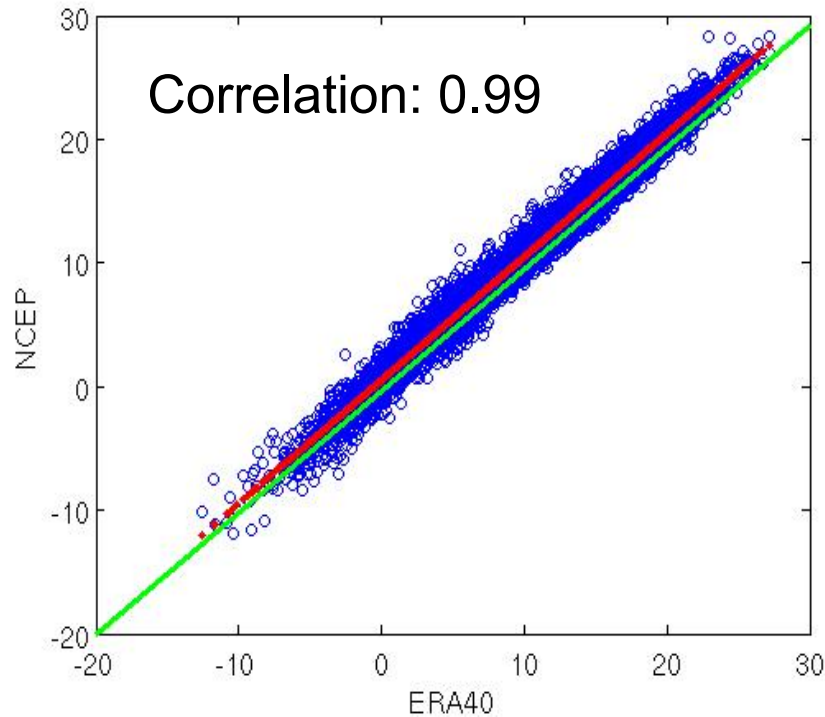
Sensitivity to initial conditions at a particular location



The further the prediction reaches into the future, the greater the difference between observed and predicted values

Paris N48.8 E2.3

Djima (Ethiopia) N7.6 E36.8

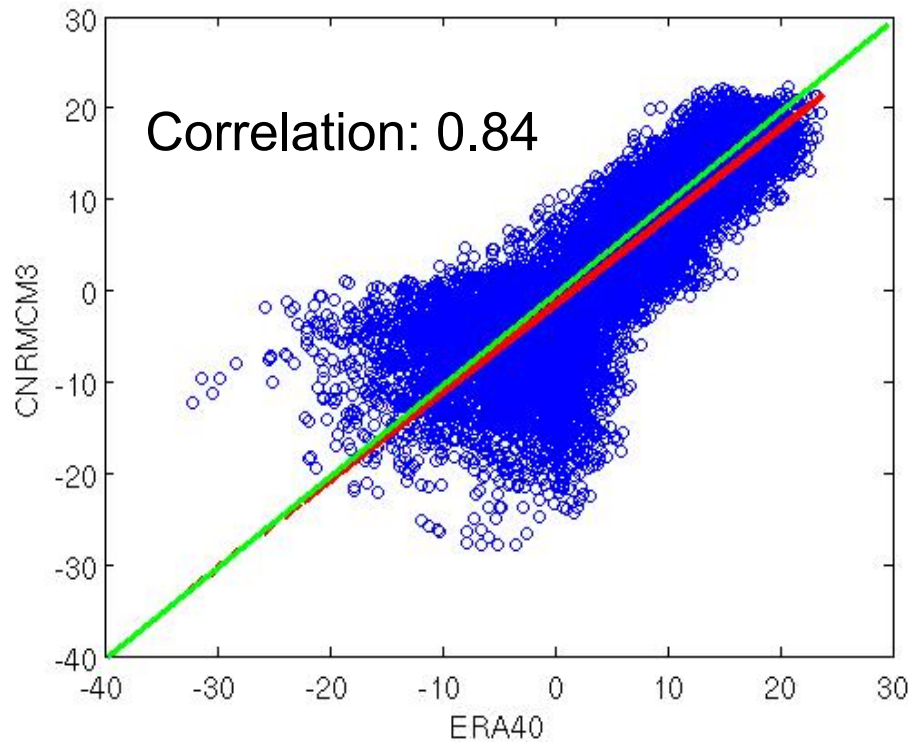


Possible problems:

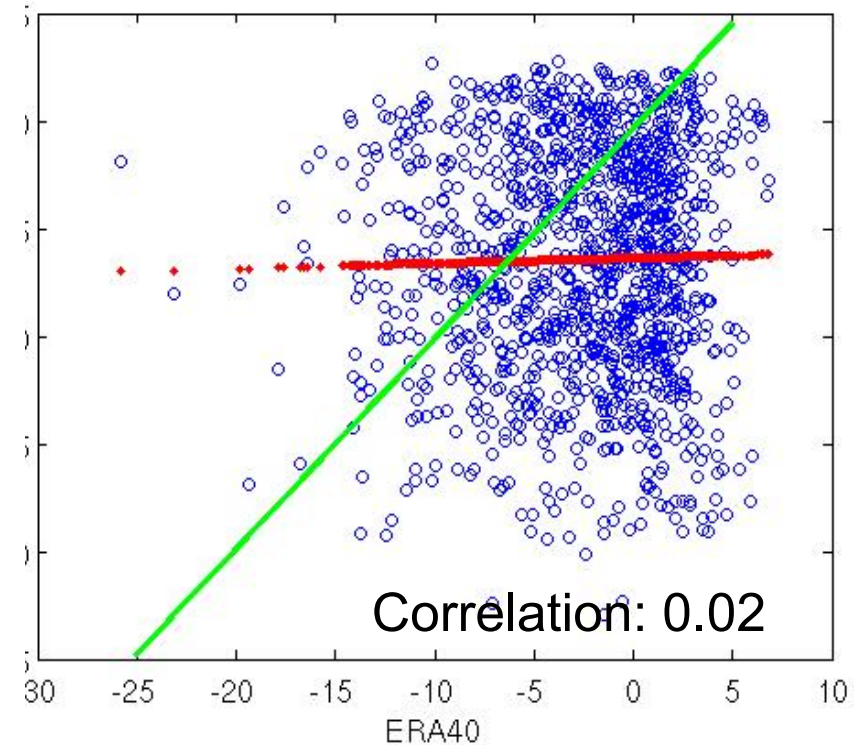
- lack of data
- differences in model set-up

Tallinn N59.4 E24.8

1961-2000



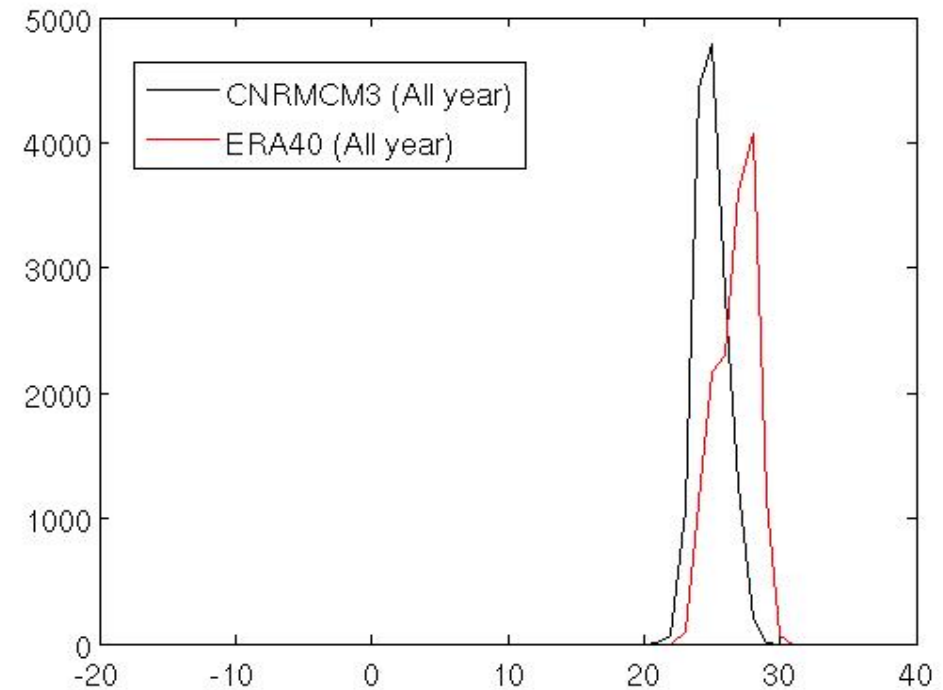
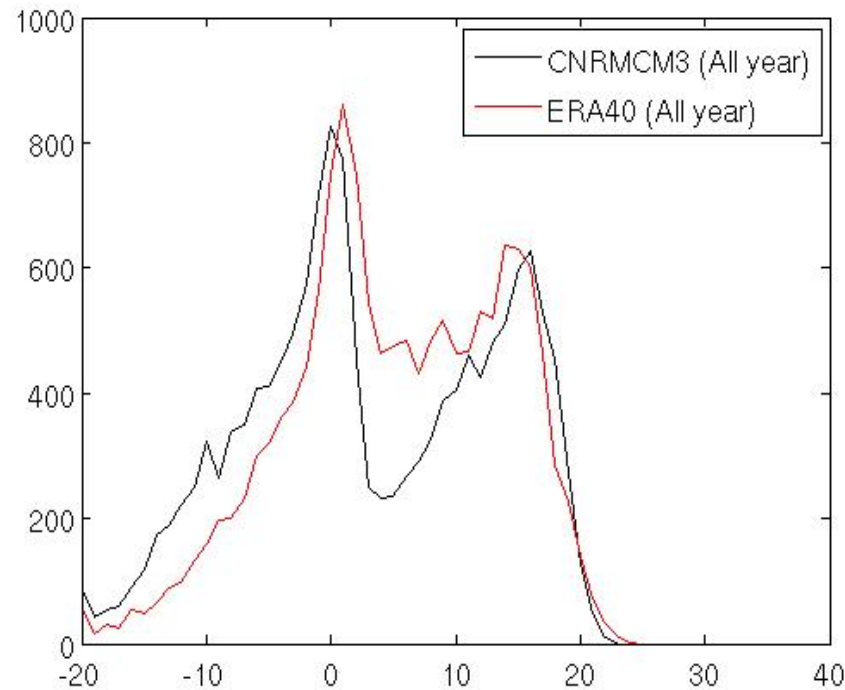
December 1961-2000



Climate models are not built for short-term forecast, but for a long-term trend

Tallinn N59.4 E24.8

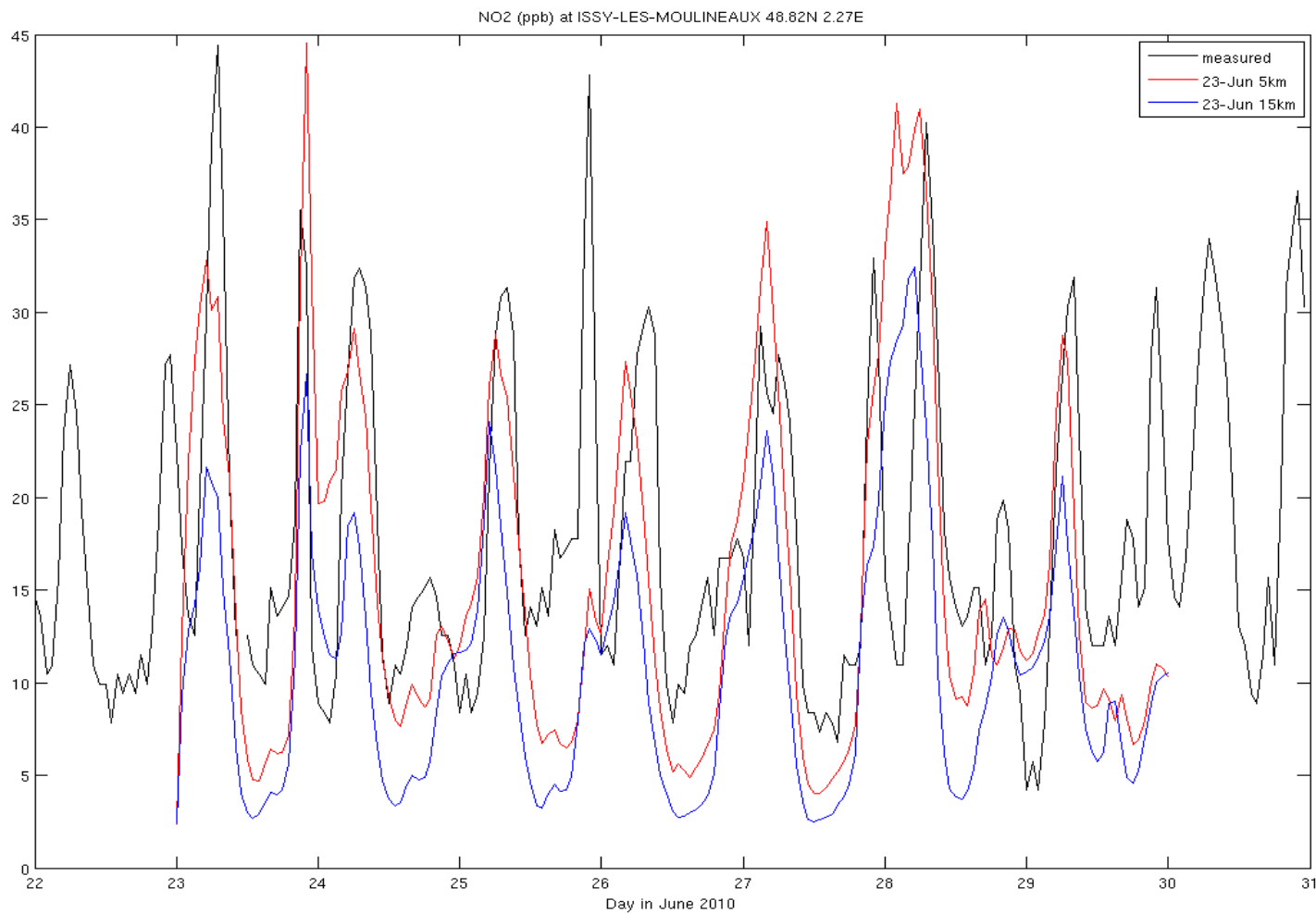
Accra N5.5 E-0.25



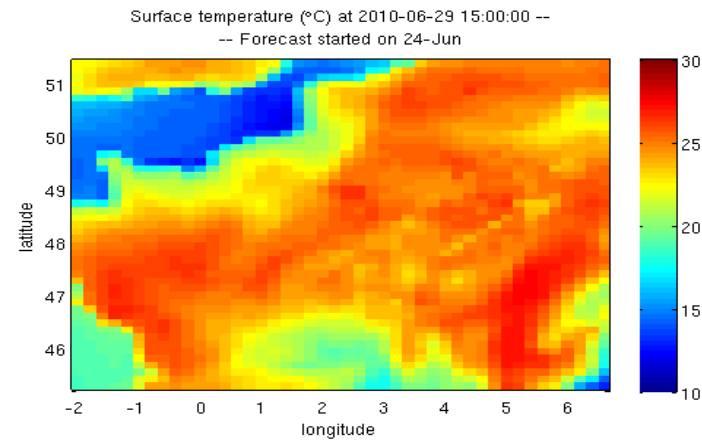
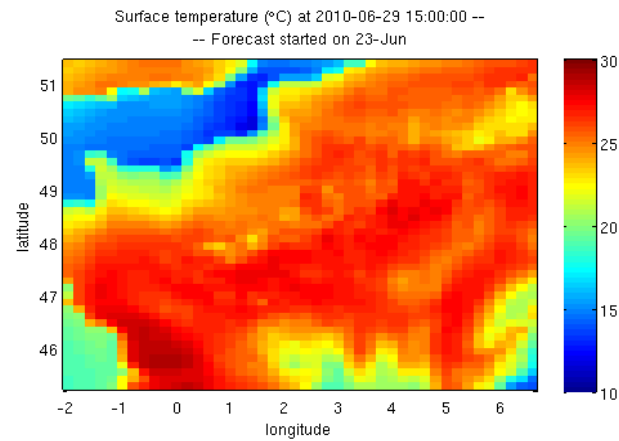
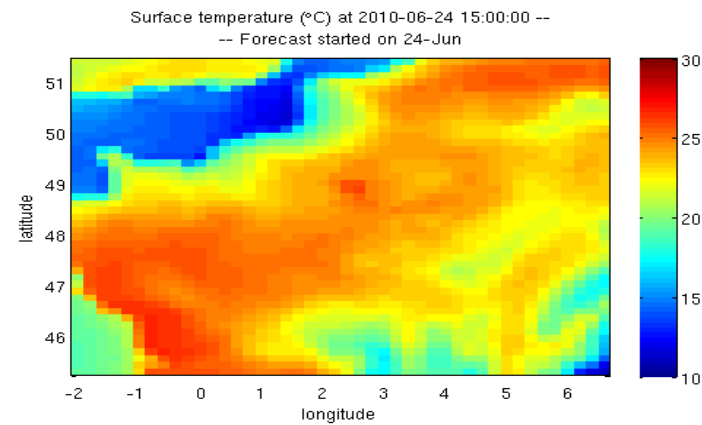
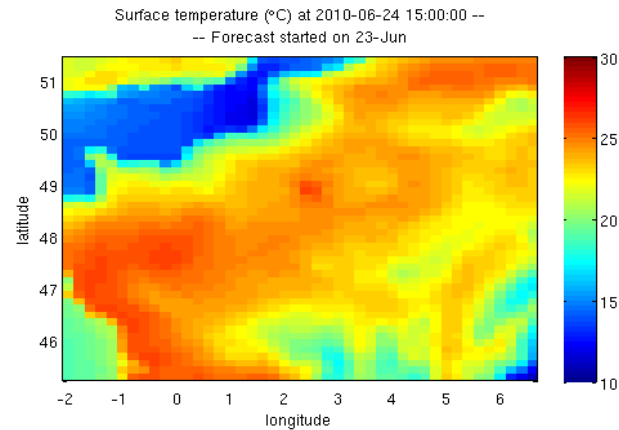
- bias of climate model in areas with high and low variability in temperature

Sensitivity to resolution

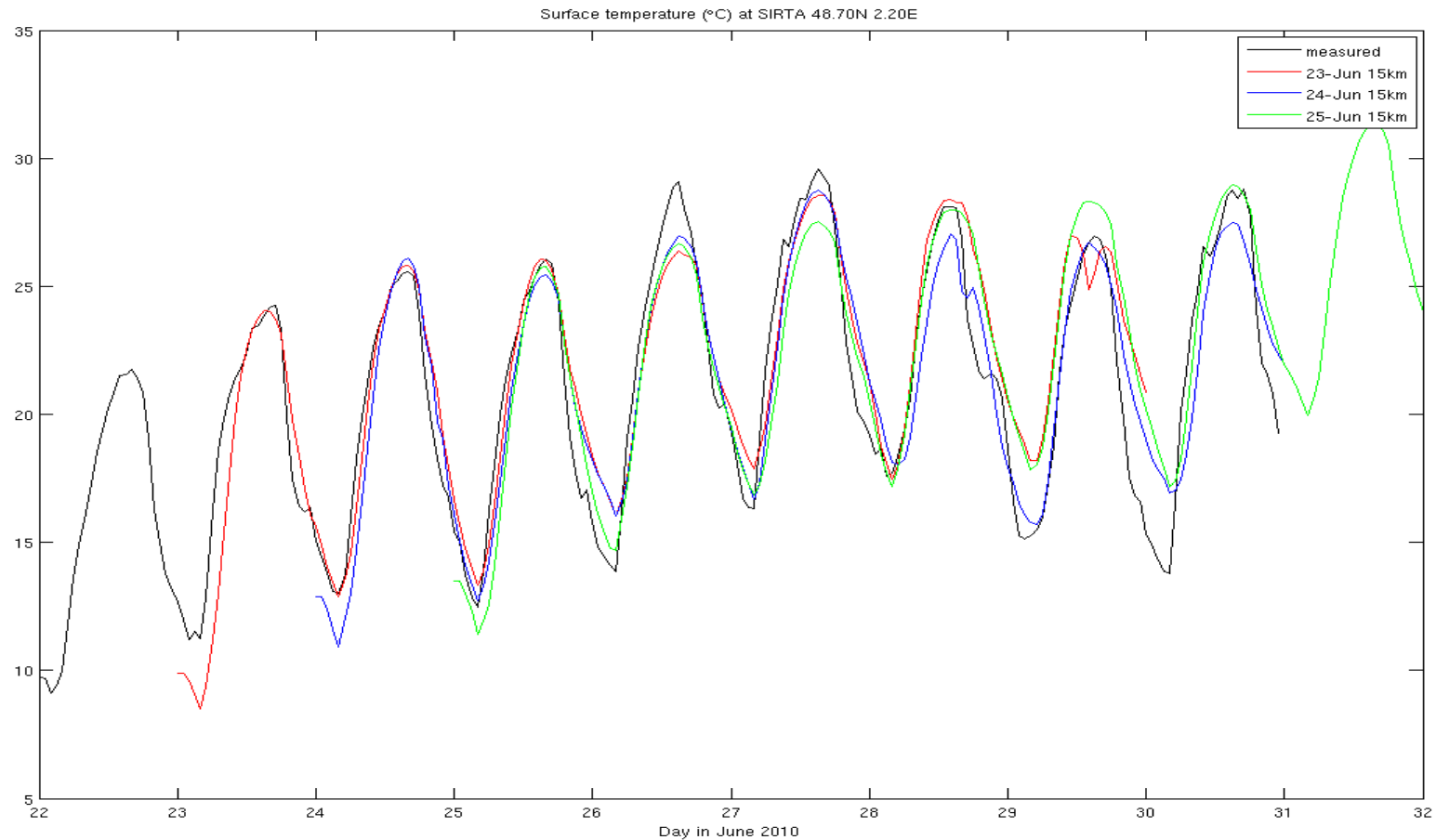
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Sensitivity to initial conditions



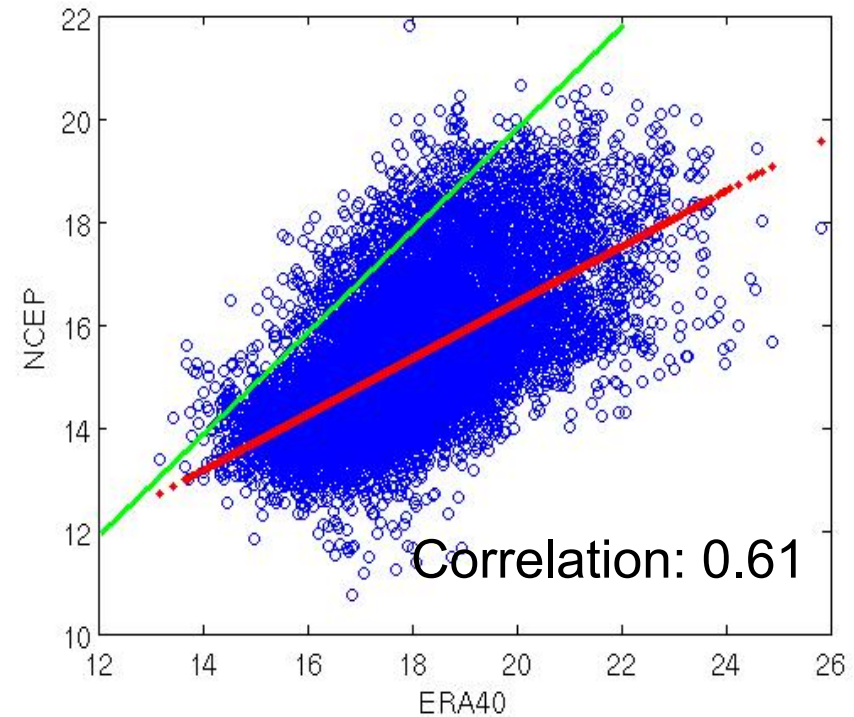
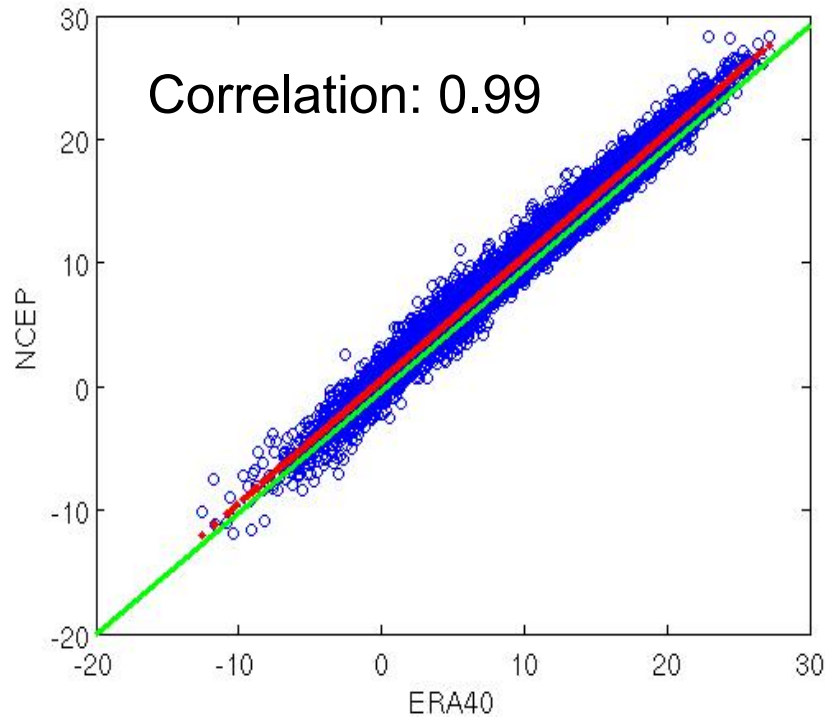
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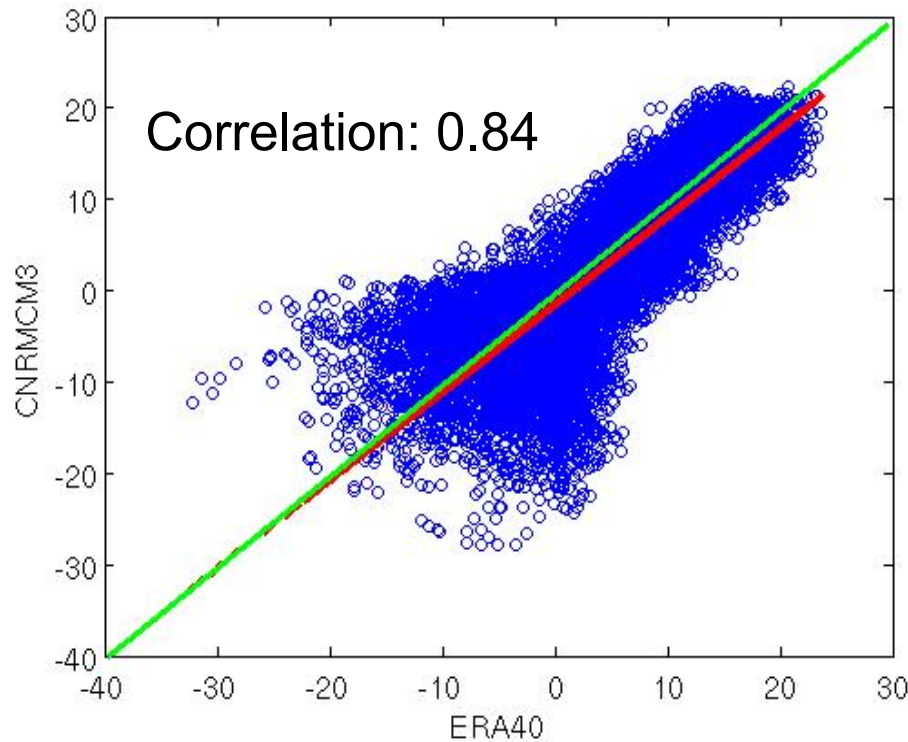


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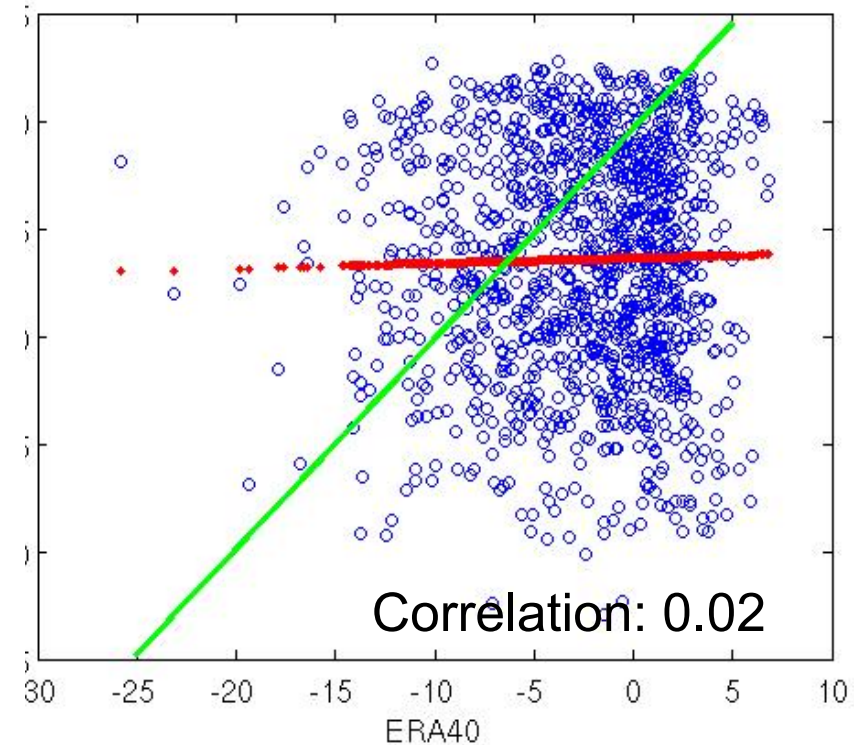
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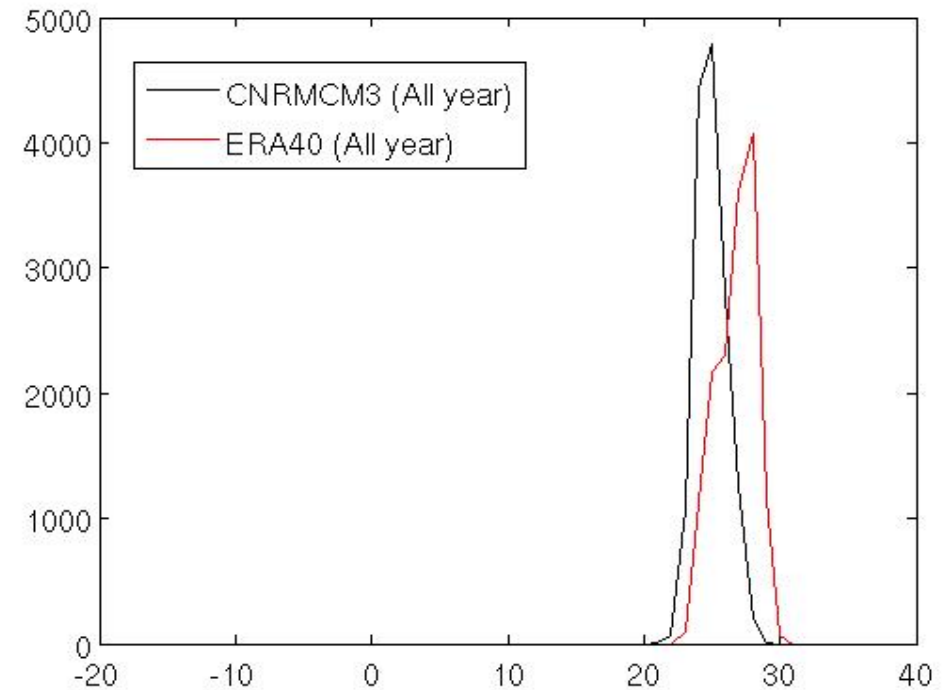
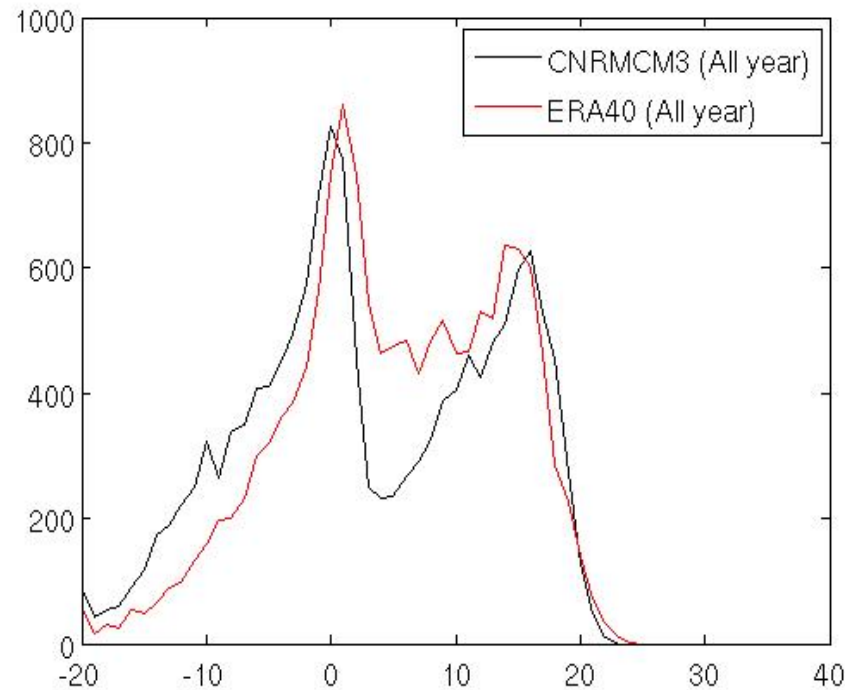
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